NAVAL POSTGRADUATE SCHOOL
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THESIS

A MULTIVARIATE ANALYSIS OF DEFENSE EXPENDITURES IN LATIN AMERICA

by

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June 1985

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A Multivariate Analysis of Defense Expenditures in Latin America

by

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ABSTRACT

This study attempts to determine whether developing countries differ with regard to the impact that military and social expenditures have on their overall rates of economic growth. A discriminant analysis of sixty-seven developing countries indicated that based on a relatively small number of discriminating variables developing countries could be categorized as either relatively dynamic or undynamic. Through a multivariate analysis of socio-economic data this study concludes that: 1) military expenditures are positively related to social expenditures and economic growth for the less economically dynamic developing countries and 2) military expenditures are negatively related to social expenditures and economic growth for the more economically dynamic developing countries. The analysis of economic growth and expenditure models also suggest that Latin America is not unique as a region when compared to the other developing countries of the world. The findings of this study are intended to contribute to the formulation of a general theory of defense expenditures and economic growth.

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I. INTRODUCTION

The purpose of this study is to examine the effects of defense and selected social expenditures upon economic growth. This examination involves a cross-sectional, multivariate analysis of socio-economic data gathered from 96 developing countries around the world. Particular attention is paid to the Latin American case to determine if these countries differ significantly from other countries of the world.

The first notable work involving factors that affect economic development was conducted by Benoit in the 1970's. Benoit found that his, "...evidence does not indicate that defense has any net adverse effect on growth in developing countries." [Ref. 1:p. XIX] Benoit further suggested that defense programs made some positive contribution to civilian economies, such as (1) providing manpower training, (2) supplying dual use infrastructure such as roads, bridges, ports and communications facilities, (3) construction by the military of schools and clinics and (4) providing security for civilians [Ref. 1:p. 17].

A recent study by Frederiksen and Looney hypothesized that, "...the impact of added defense expenditures may be either positive or negative and will depend on the resource constraints faced by individual developing nations." [Ref. 2:p. 113] They found that, "...defense expenditures do not

compete excessively for scarce resources in countries which are relatively resource unconstrained...(While) countries suffering from a relative lack of resources experience no statistically discernible effect on economic growth from defense spending." [Ref. 2:p. 124]

As a follow-on to the above studies, this study intends to examine the relative contribution of defense and other government expenditures such as health and education to economic growth. This study should provide results that will add to a general theory of defense expenditures and economic growth.

The hypothesis of this study is that smaller less economically developed countries will sacrifice social expenditures in favor of defense while more economically dynamic countries will be able to maintain a desired level of defense preparedness while supporting social needs. This is based upon the assumption that military expenditures have a positive effect on economic growth while social expenditures have a negative effect on growth. The effect of defense and social expenditures on growth will be ascertained by the application of a regression equation upon the developing countries which will be divided into two groups according to their degree of urbanization and economic size (gross domestic product). The regression equation will reflect economic growth based upon variables derived from a factor analysis. The developing countries will be divided into economically dynamic groups through the use of a discriminant analysis.

Benoit's observation that, "Relatively secure areas like Latin America, ..., had generally low defense burdens" [Ref. 1:p. 2], led to a further investigation in this study to determine the uniqueness of the Latin American case. The regression equation will first be applied to the Latin American countries as a region and then to its economically dynamic groups of countries and compared in each instance to the corresponding group of the remaining developing countries of the world.

In Chapter II, a more detailed methodology is presented and followed in Chapter III by the findings of each step of the analysis. Finally, the conclusions indicate that the hypothesis is generally supported by the evidence.

II. METHOD OF STUDY

The principle methods of analysis used in this study were factor analysis, regression analysis and discriminant analysis. Several steps in the study were aided through the use of correlation analysis, stepwise regression analysis and stepwise discriminant analysis. The programs for each analysis utilized the Statistical Analysis System (SAS) [Ref. 3].

A. DATA AND VARIABLE SELECTION

The 96 developing countries selected for this are listed by region of the world in Table I. The principal variables reflecting economic and development were operationalized using economic and social variables chosen from an extensive data base. The data base was extracted from publications issued by the International Monetary Fund [Ref. 4], Yales University [Ref. 5], and the World Bank [Ref. 6]. Economic data were primarily used because (1) they are empirically observable, (2) they are valid in that they are directly indicative of growth and (3) they are reliable since they can be applied with consistent results and they apply the same measurement to all observations. The variables selected as shown in Table II were grouped as follows:

1. Economic Growth: Variables were chosen to reflect average annual growth in Gross National Product (GNP), Gross Domestic Product (GDP), investment, savings, imports and exports. The periods of annual growth

TABLE I

DEVELOPING COUNTRIES BY REGION

1. LATIN AMERICA - REGION 1:

NICARAGA	ECUADOR	HONDURAS	COLOMBIA
COSTA RICA	DOM. REP.	BOLIVIA	PANAMA
GUATEMALA	CHILE	EL SALVADOR	URUGUAY
PARAGUAY	ARGENTINA	VENEZUELA	JAMAICA
MEXICO	TRINIDAD	BRAZIL	PERU
HAITI			

2. EUROPE - REGION 2:

GREECE	TURKEY	PORTUGAL

3. EUROPE -REGION 3:

YUGOSLAVIA	SPAIN

4. MIDDLE EAST - REGION 4:

ISRAEL	EGYPT	IRAN	SAUDI ARABIA
IRAQ	KUWAIT	SYRIA	NORTH YEMEN
LEBANON	JORDAN	OMAN	ADEN
UAE			

5. ASIA - REGION 5:

INDIA	AFGHANISTAN	PAKISTAN	BANGLADESH
SRILANKA	BHUTAN	NEPAL	

6. EAST ASIA - REGION 6:

TAIWAN	INDONESIA	KOREA	SINGAPORE
PHILIPPINES	HONG KONG	THAILAND	MALAYSIA
BURMA	PAPUA	LAOS	VIETNAM

7. AFRICA - REGION 7:

CAMEROON	NIGERIA	SUDAN	SENEGAL
SOMALIA	TOGO	TUNISIA	MOROCCO
RWANDA	MALAWI	NIGERIA	MALI
UPPER VOLTA	BENIN	ALGERIA	LIBYA
LIBERIA	IVORY COAST	MAURITANIA	CONGO
SIERRA LEONE	CHAD	MADAGASCAR	TANZANIA
UGANDA	ETHIOPIA	CAR	ANGOLA
GHANA	MOZAMBIQUE	ZAIRE	ZAMBIA
BURUNDI	GUINEA	LESOTHO	SOUTH AFRICA
ZIMBABWE	KENYA		

TABLE II

DESCRIPTION FOR VARIABLES
USED IN THE
FIRST FACTOR ANALYSIS

GNPG78	AVERAGE ANNUAL GROWTH PER CAPITA OF GNP 1960-76
FPER78	INDEX OF AVERAGE PER CAPITA FOOD PRODUCTION 1974-76
EPPER78	AVERAGE ANNUAL GROWTH IN ENERGY PRODUCTION 1960-75 OF GNP 1970-82
PDPG78	AVERAGE ANNUAL GROWTH OF EXTERNAL PUBLIC DEBT AS A PERCENTAGE OF GNP 1970-76
LFGA84	AVERAGE ANNUAL GROWTH OF LABOR FORCE 1960-70
LFGB84	AVERAGE ANNUAL GROWTH OF LABOR FORCE 1970-82
UPPA84	URBAN POPULATION AS A PERCENTAGE OF TOTAL POPULATION 1960
UPPB84	URBAN POPULATION AS A PERCENTAGE OF TOTAL POPULATION 1982
UPGA84	AVERAGE ANNUAL GROWTH OF URBAN POPULATION 1960-70
UPGB84	AVERAGE ANNUAL GROWTH OF URBAN POPULATION 1970-82
YCGRY	CENTRAL GOVERNMENT CURRENT REVENUE AS A PERCENTAGE OF GDP
YMEYSG	AVERAGE ANNUAL GROWTH OF MILITARY EXPENDITURE AS A PERCENTAGE OF GNP 1965-78
YETYSG	AVERAGE ANNUAL GROWTH OF PUBLIC EDUCATION AND HEALTH EXPENDITURE AS A PERCENTAGE OF GNP 1965-78
YCCYSG	AVERAGE ANNUAL GROWTH OF GENERAL GOVERNMENT CONSUMPTION AS A PERCENTAGE OF GDP 1960-78
YPCYSG	AVERAGE ANNUAL GROWTH OF PRIVATE CONSUMPTION AS A PERCENTAGE OF GDP 1960-78
YIYSG	AVERAGE ANNUAL GROWTH OF GROSS DOMESTIC INVESTMENT AS A PERCENTAGE OF GDP 1965-78
YLFPAGSG	AVERAGE ANNUAL GROWTH OF THE PERCENTAGE OF LABOR IN AGRICULTURE 1960-77
YLFPISG	AVERAGE ANNUAL GROWTH OF THE PERCENTAGE OF LABOR IN INDUSTRY 1960-77
YLFPSSG	AVERAGE ANNUAL GROWTH OF THE PERCENTAGE OF LABOR IN SERVICES 1960-77
YCGCEY	CENTRAL GOVERNMENT CURRENT EXPENDITURES AS A PERCENTAGE OF GDP 1978
YGGNPPA	AVERAGE ANNUAL GROWTH OF GNP 1960-75
YGGNPPB	AVERAGE ANNUAL GROWTH OF GNP 1970-78
EXPG84	AVERAGE ANNUAL GROWTH OF EXPORTS 1960-82
GDPGB84	AVERAGE ANNUAL GROWTH OF GDP 1970-82
GDIGA84	AVERAGE ANNUAL GROWTH OF GROSS DOMESTIC INVESTMENT 1960-70
GDIGB84	AVERAGE ANNUAL GROWTH OF GROSS DOMESTIC INVESTMENT 1970-82
GDSVG84	AVERAGE ANNUAL GROWTH OF GROSS DOMESTIC SAVINGS 1960-82
DSGG84	AVERAGE ANNUAL GROWTH OF DEBT SERVICE AS A PERCENTAGE

ranged from 5 to 22 years during the time period from 1960 to 1982.

2. Structural Indicators: These variables measure government comsumption, revenues and debt. Private consumption, social spending and military expenditures were also included.

3. Other Indicators: These variables were chosen to reflect shifts in the population, the labor force, food production and energy production associated with general economic development.

B. FACTOR ANALYSIS

The first factor analysis applied in this study was used to determine the best indicators of economic growth. This analysis provides this information by reducing the 29 selected variables into a number of independent groups or factors. Each factor included variables that reflected some major aspect of economic growth. The weight a variable carried in a given factor was indicated by an associated number called its factor loading. The highest loading variable in each factor of the orthogonally rotated transformation matrix was then used to represent that factor in a subsequent regression analysis.

C. REGRESSION ANALYSIS

Regression analysis was used to develop the model equation for economic growth necessary to test the hypothesis of this study. Selected variables from the factor analysis provided the independent and dependent variables for the equation. The dependent variable was selected as the best indicator of economic growth. The independent variables with

minimum correlation that were selected explained some proportion of the variance in the growth indicator variable. The test variables representing growth in military and social spending were added at this point to complete the model.

A stepwise regression analysis was utilized to determine the best order of the independent variables in the model. This analysis ranked the variables in order of their contribution to explaining the variance in the dependent variable.

The resulting model provided a gross indication of the relationship between military and social expenditures and economic growth for all of the developing countries in the study.

D. DISCRIMINANT ANALYSIS

Discriminant analysis was used to divide the 96 countries in this study into groups according to their level of development. The variables used in this analysis were selected by using the results from a second factor analysis and a stepwise discriminant analysis.

From this factor analysis the principle variables reflecting the level of economic development were operationalized using economic and social variables from the data base. At this point the data base was expanded to include data published by R. L. Sivard [Ref. 7]. In addition to several growth related variables from the first factor analysis more variables were added to reflect the absolute level of economic and social development in the years 1976 through 1982.

The variables are listed in Table III. Economic indicators included GDP, investment, savings, imports and exports. Structural indicators included government consumption, revenues and debt and private consumption, social and military expenditures. Other indicators included life expectancy, calories per capita and labor shifts.

The second factor analysis, like the first, provided independent groupings for the variables as factors. The leading variables in each of these factors were then put into the discriminant analysis.

The discriminant analysis divided the countries in the study into two groups based on the above input variables. The probability of the correct placement of each country in a group was also provided. These probabilities were used as a measure of how well the input variables used in the analysis split the countries into two groups. The standard for this study was to have a majority of the countries placement probability above 80 percent.

E. TEST OF THE MODEL

In order to provide the evidence necessary to support the hypothesis the model was tested. The test was conducted by applying the model to each of the two groups of countries derived from the discriminant analysis.

In order to prove the Latin American case the model was first applied to all the Latin American countries. Then the

TABLE III

DESCRIPTIONS FOR VARIABLES
USED IN THE
SECOND FACTOR ANALYSIS

ECPER78	Average annual growth in energy production 1960-75
GNPG78	Average annual growth per capita of GNP 1960-76
FPER78	Index of average per capita food production 1974-76
EPPER78	Average annual growth in energy production 1960-75
PDPB78	External public debt as a percentage of GNP 1976
MTZ78	Merchandise imports 1976
ZGB78	Average annual increase in imports 1970-76
LFGB84	Average annual growth of labor force 1970-82
UPPB84	Urban population as a percentage of total population 1982
UPGB84	Average annual growth of urban population 1970-82
YMEYSG	Average annual growth of military expenditure as a percentage of GNP 1965-78
YETYSG	Average annual growth of public education and health expenditure as a percentage of GNP 1965-78
YLFPAGSG	Average annual growth of the percentage of labor in agriculture 1960-77
YLFPISG	Average annual growth of the percentage of labor in industry 1960-77
YLFPSSG	Average annual growth of the percentage of labor in services 1960-77
EXPG84	Average annual growth of exports 1960-82
GDPGB84	Average annual growth of GDP 1970-82
GDIGB84	Average annual growth of gross domestic investment 1970-82
LE84	Life expectancy at birth 1982
MEB84	Machine and transport equipment as a percentage of merchandise exports 1981
OMEB84	Other manufactures as a percentage of merchandise exports 1981
GDPB84	GDP 1982
TEB84	Textile and clothing as a percentage of merchandise exports 1981
OPCEB84	Other primary commodities as a percentage of merchandise exports 1981
SGB84	Average annual growth of services 1970-82
IGB84	Average annual growth of industry 1970-82
MGB84	Average annual growth of manufacturing 1970-82
GDSB84	Gross domestic savings as a percentage of GDP 1982
DSGG84	Average annual growth of debt service as a percentage of GNP 1970-82
EB84	Exports of goods and services as a percentage of GDP 1982
AGB84	Average annual growth of agriculture 1970-82
FEB84	Fuels, minerals and metals as a percentage of merchandise exports 1981
SCP	Calories per capita 1979
SPW	Percentage of population with safe water 1979
SIMR	Infant mortality rate 1979]

model was applied to the two groups of Latin American countries provided by the discriminant analysis.

The results of each application of the model to the general world case and the specific case of Latin America were compared in order to support the hypothesis of this study.

III. FINDINGS OF THE STUDY

In this chapter the findings of the study are presented. Several tables are included to help summarize the results of the study. In addition to the findings some further methodologies are introduced that more accurately describe the actual progression of the study. These methodologies were utilized to better operationalize the principal hypothesis through a systematic and objective variable selection process.

A. RESULTS OF THE FIRST FACTOR ANALYSIS

As indicated in Chapter II the first factor analysis was applied in this study to determine the best indicators of economic growth. The results of the orthogonally rotated factor analysis, shown in Table IV, indicated that 99 percent of the variance in the 28 selected variables could be accounted for by six factors. Factor one grouped variables that reflected central government fiscal activity including revenues and expenses. Factor two depicted aggregate economic variables like GNP and GDP along with investment and savings. Factor three primarily reflected labor force movements in industry and services and GNP growth. Factor four included both government and private consumption variables along with several more labor shift variables. Factor five reflected the growth of the urban population. Factor six included both

TABLE IV

RESULTS OF THE FIRST FACTOR ANALYSIS

ROTATED FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR
YCGRY	92 *	3	15	2	10	-9
YCGCEY	90 *	-10	-5	20	16	11
YETYSG	71 *	-3	7	25	4	21
YMEYSG	63 *	-13	-29	-14	23	8
EXPG84	63 *	36 *	28	-21	-4	21
YGGNPPB	1	64 *	13	15	-1	-4
GDPGB84	-4	84 *	-8	-30	-15	-16
GNPG76	32	77 *	0	24	5	16
GDIGB84	-16	67 *	11	-35 *	-8	-40*
GDIGA84	0	60 *	-29	-8	-11	52*
YIYSG	-21	59 *	11	9	15	2
CDSVG84	-5	58 *	42 *	-35 *	19	-5
YLFPISG	15	13	81 *	31	-2	5
YGGNPPA	17	3	81 *	35 *	-6	-19
YLFPSSG	-4	-3	80 *	24	29	-7
FPER78	30	38 *	-41 *	-12	16	-16
FPPER78	36 *	-20	-49 *	-11	-11	6
UPGB84	-25	-13	-57 *	-4	-27	33
YPCYSG	-20	-4	37 *	73 *	23	-1
YGCYSG	33	-3	12	69 *	9	5
YLFPAGSG	-12	7	29	49 *	7	-6
LFGB84	-32	-2	-17	-62 *	24	18
LFGA84	4	11	-12	-70 *	20	14
UPPA84	17	9	14	0	95 *	-10
UPPB84	15	4	10	-3	93 *	15
DSCG84	40 *	4	17	2	30	65*
PDPG78	38 *	-27	-25	-17	1	65*
UPGA84	-7	-3	-26	-38 *	-13	58*

public debt and debt service variables and another urbanization indicator.

The values of the factor loadings shown in Table IV corresponded to the extent of the correlation between each variable and factor. The program flagged values greater than .34 with an asterisk. Only 28 countries were used on the analysis. The remaining 68 countires were omitted due to missing data.

The highest loading variables in each of the six factors were selected for the regression analysis. The variables included YGCRY, YGGNPPB, YLFPISG, YPCYSG, UPPA84 and DSGG84.

B. RESULTS OF THE REGRESSION ANALYSIS

In order to build a model equation for economic growth using the leading variables from each factor listed above were put into a regression analysis. Of the six variables available YGGNPPB was designated as the best dependent variable to represent overall economic growth. The remaining five variables were put into the program as independent variables.

The results of the regression analysis are shown in Table V. Based on 50 countries the correlation coefficient for the equation was only .0041. This result indicated that five independent variables explained less than one percent of the variation in YGGNPPB. The weakness of the equation was also apparent in the low f-value for the equation, the low t-statistic for each variable parameter and by the fact that the residual error of only three countries fell within two

TABLE V

RESULTS OF THE REGRESSION ANALYSIS

DEP VARIABLE: YGGNPPB

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	5	342.410	68.482011	0.041	0.9990
ERROR	50	83070.350	1661.407		
C TOTAL	55	83412.760			
ROOT MSE		40.760361	R-SQUARE	0.0041	
DEP MEAN		9.351786	ADJ R-SQ	-0.0955	
C.V.		435.8564			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR HO: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	8.895092	0.607	0.5468	0.000000
YLFPISG	1	-2.227256	-0.186	0.8535	-0.029922
YGGRY	1	0.210880	0.325	0.7463	0.051273
YPCYSG	1	1.511223	0.284	0.7776	0.045517
UPPA84	1	-0.024814	-0.093	0.9260	-0.014156
DSGG84	1	-0.447996	-0.245	0.8076	-0.035270

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	ISRAEL	1.600	11.537	-9.937	33.680	-0.295	
2	GREECE	3.800	10.379	-6.579	39.736	-0.166	
3	TAIWAN	5.700	.	.	.	.	
4	NICARAG	1.700	5.172	-3.472	37.463	-0.093	
5	INDIA	1.800	.	.	.	.	
6	HONDURAS	0.400000	6.593	-6.193	39.795	-0.156	
7	CAMEROON	2.800	10.755	-7.955	39.931	-0.199	
8	NIGERIA	4.400	8.818	-4.418	39.127	-0.113	
9	INDONES	5.300	10.552	-5.252	40.134	-0.131	
10	SUDAN	2.600	9.732	-7.132	39.704	-0.180	
11	COSTAR	3.300	7.247	-3.947	39.994	-0.099	
12	BOLIVIA	5.100	8.118	-3.018	39.278	-0.077	
13	SENEGAL	-.300000	9.873	-10.173	40.283	-0.253	
14	SOMALIA	-.100000	.	.	.	.	
15	EGYPT	6.300	11.507	-5.207	37.857	-0.138	
16	TOGO	0.700000	8.430	-7.730	38.809	-0.199	
17	TUNISIA	5.700	.	.	.	.	
18	MOROCCO	3.900	8.471	-4.571	38.889	-0.118	
19	KOREA	8.100	4.326	3.774	36.931	0.102	
20	RWANDA	1.400	9.940	-8.540	39.298	-0.217	
21	GUATEM	3.300	8.547	-5.247	39.476	-0.133	
22	AFGHAN	2.700	.	.	.	.	
23	MALAWI	3.100	8.543	-5.443	39.771	-0.137	
24	NIGER	-.600000	9.282	-9.882	38.809	-0.255	
25	SINGAPOR	6.600	7.417	-.816554	34.874	-0.023	
26	ELSALV	2.200	9.901	-7.701	39.492	-0.195	
27	MALI	1.800	10.841	-9.041	39.768	-0.227	
28	PAKISTAN	1.500	.	.	.	.	
29	UPPERVOL	-1.000	10.874	-11.874	39.766	-0.299	
30	BENIN	1.400	10.413	-9.013	39.593	-0.228	
31	TURKEY	4.100	9.874	-5.774	40.258	-0.143	
32	YUGOSLV	5.000	.	.	.	.	
33	SPAIN	3.100	10.513	-7.413	38.973	-0.190	
34	PARAGUA	4.500	9.720	-5.220	39.512	-0.132	
35	VENEZUEL	3.100	9.520	-6.420	39.112	-0.164	
36	IRAN	13.300	.	.	.	.	
37	MEXICO	1.300	7.036	-5.736	39.521	-0.145	
38	BRAZIL	6.000	.	.	.	.	
39	ALGERIA	2.600	.	.	.	.	
40	PHILIPP	3.700	7.427	-3.727	39.487	-0.094	
41	HONGKONG	6.900	.	.	.	.	
42	LIBYA	-2.600	.	.	.	.	
43	ECUADOR	5.600	3.365	2.235	37.669	0.059	
44	COLOMBIA	3.600	7.753	-4.353	39.301	-0.111	
45	THILAND	4.500	8.610	-4.110	39.932	-0.103	
46	MALAYSIA	4.800	9.205	-4.405	40.041	-0.110	

TABLE V (cont'd)

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
47	DOMINR	4.200	8.355	-4.155	39.580	-0.105	
48	LIBERIA	0.200000	10.498	-10.298	40.223	-0.256	
49	IVORYCOA	0.900000	.	.	.	.	
50	MAURIT	-.600000	8.523	-9.123	39.246	-0.232	
51	CONGO	0.200000	.	.	.	.	
52	SIERRAL	-1.300	.	.	.	.	
53	PANAMA	0.500000	4.113	-3.613	34.193	-0.106	
54	CHILE	2.100	.	.	.	.	
55	CHAD	-.600000	12.407	-13.007	39.328	-0.331	
56	URUGUAY	1.300	9.341	-7.541	37.781	-0.200	
57	MADAGAS	-2.700	10.181	-12.881	39.935	-0.323	
58	TANZANIA	1.700	11.941	-10.241	39.456	-0.260	
59	UGANDA	-2.300	.	.	.	.	
60	ETHIOPIA	-.100000	10.528	-10.628	39.685	-0.268	
61	CAR	1.600	.	.	.	.	
62	ANGOLA	-10.500	.	.	.	.	
63	GHANA	-3.000	10.950	-13.950	39.536	-0.353	
64	BANGLAD	0.200000	.	.	.	.	
65	MOZAMBIQ	-5.500	.	.	.	.	
66	PORTUGAL	6.200	13.581	-6.681	31.368	-0.213	
67	BURMA	1.700	.	.	.	.	
68	SRILANKA	1.900	11.439	-9.539	39.935	-0.239	
69	ZAIRE	-2.200	8.870	-11.070	39.763	-0.278	
70	ARGENTIN	5.100	10.276	-7.176	32.753	-0.219	
71	JAMAICA	3.600	3.999	-.399267	33.097	-0.012	
72	TRINIDAD	2.500	9.699	-7.199	32.406	-0.222	
73	ZAMBIA	-.900000	10.120	-11.020	40.143	-0.274	
74	PERU	0.300000	9.387	-9.087	37.562	-0.242	
75	PAPUA	3.800	.	.	.	.	
76	BURUNDI	1.300	12.627	-11.327	38.706	-0.293	
77	GUINEA	0.800000	.	.	.	.	
78	LESOTHO	4.600	.	.	.	.	
79	SOUTHAF	1580	.	.	.	.	
80	SAUDIAR	6.600	.	.	.	.	
81	ZIMBAB	.	.	.	.	.	
82	IRAQ	7.700	.	.	.	.	
83	KUWAIT	0.600000	18.373	-17.773	31.427	-0.566	* |
84	KENYA	140.000	8.654	131.346	39.773	3.302	|******
85	SYRIA	261.000	11.349	249.651	40.013	6.239	|******
86	NYEMEN	.	.	.	.	.	
87	LAOS	-15.800	.	.	.	.	
88	VIETNAM	.	.	.	.	.	
89	BHUTAN	-.200000	.	.	.	.	
90	LEBANON	.	.	.	.	.	
91	JORDAN	7.000	.	.	.	.	
92	NEPAL	0.300000	.	.	.	.	
93	HAITI	2.200	.	.	.	.	
94	OMAN	3.700	.	.	.	.	
95	ADEN	.	.	.	.	.	
96	UAE	-5.600	.	.	.	.	
SUM OF RESIDUALS			6.7501				
SUM OF SQUARED RESIDUALS			830				

standard deviations of center. This model, while objective, was not considered significant enough to represent economic growth. The standard for the model was set at having a correlation coefficient of .50 or better. Due to these results an alternative method for variable selection was deemed necessary.

The second iteration of the variable selection was more subjective. A single factor was chosen from the factor analysys that best represented overall economic growth. Factor two was selected since it contained three aggregate measures of GNP and GDP along with other indicators of domestic investment and savings. In order to select the best variables for the model another product of the factor analysis, the correlation analysis, was consulted.

As shown in Table VI the variables in the correlation analysis were listed in a matrix. The variables in factor two are listed horizontally while all 28 variables are listed vertically. Correlation values are indicated for each pair of variables with values above .35 flagged with an asterisk. The objective of the variable selection using the correlation table was to select a dependent variable then select independent variables that are highly correlated with it but not correlated with each other.

In this investigation YGGNPPB, GDPGB84 and GNPG78 were chosen as possible dependent variables. GDIGA84, GDIGB84, YIYSG and GDSVG84 were chosen as possible independent

TABLE VI

RESULTS OF THE CORRELATION ANALYSIS

	CORRELATIONS						
	YGGNPPB	GDPGB84	GNPG78	GDIGB84	GDIGA84	YIYSG	GDSVG84
YGGNPPB	100 *	61 *	73 *	50	53	49 *	41 *
GDPGB84	61 *	100 *	51 *	86	43	45 *	59 *
GNPG78	73 *	51 *	100 *	27	64	31	41 *
GDIGB84	50 *	86 *	27	100	10	44 *	57 *
GDIGA84	53 *	43 *	64 *	10	100	28	25
YIYSG	49 *	45 *	31	44	28	100 *	40 *
GDSVG84	41 *	59 *	41 *	57	25	40 *	100 *
YETYSG	5	-15	22	-31	-1	-10	-19
YMEYSG	-17	-6	9	-14	4	-25	-19
YGGCLY	-10	-18	30	-27	-8	-25	-20
YCGRY	2	-2	34	-5	-12	-12	5
YGCYSG	1	-20	22	-28	-21	16	-24
YPCYSG	5	-27	3	-14	-31	28	-10
YGGNPPA	21	-12	10	1	-35	19	24
YLFPAGSG	10	6	12	13	-21	9	-3
YLFPISG	36 *	-7	24	0	-12	6	26
YLFPSSG	2	-21	-3	0	-43	8	32
FPER78	30	42 *	31	26	20	21	12
EPPER78	-34	-10	-5	-32	11	-31	-29
EXPG84	35 *	24	45 *	13	29	11	38 *
DSGG84	0	-17	31	-31	23	1	11
LFGA84	-12	36 *	-9	34	11	16	29
LFGB84	-8	16	-31	19	14	-4	15
UPPA84	3	-19	9	-10	-18	11	25
UPPB84	3	-15	18	-15	0	11	25
UPGA84	-27	14	-9	-1	33	5	-5
UPGB84	-22	1	-16	-15	35	-10	-40 *
PUPG78	-30	-26	-9	-46	28	-29	-29

variables. The first step in reducing the possibilities was to select the dependent and independent variables with the highest correlation. The table showed that GDPGB84 and GDIGB84 had the highest correlation which was 86. Then using GDPGB84 as the best dependent variable the other independent variables were tested with it. GDSVG84 had the next highest correlation at 59 but was deleted due to its high correlation with GDIGB84 at 57. YIYSG had a correlation with GDPGB84 of 45 but was deleted since it measured gross domestic investment over a similar period as GDIGB84. GDIGA84 had a correlation value of 43 and was selected for the equation. In sum, the analysis of the correlation values produced GDPGB84 as the independent variable for the equation with GDIGB84 and GDIGA84 as the independent variables. At this point the two test variables, YMEYSG and YETYSG, were introduced as independent variables into the equation. These two variables also did not correlate highly with the other independent variables.

Having the principal and test variables for the growth equation model the next step taken was to do a stepwise regression analysis. This was done to determine if the variables collectively yielded a significant correlation and, if so, to find the best order of the independent variables in the equation.

The results of the stepwise regression analysis were based on data from 56 countries. The independent variables

provided by the analysis in order of their contribution to the variation in GDPGB84 were:

(1) GDIGB84 with an r-squared of .60,

(2) YMEYSG with a cumulative r-squared of .63 and

(3) GDIGA84 with a cumulative r-squared of .65.

YETYSG did not meet the .15 significance level for entry into the equation but was retained as a test variable for the subsequent regression analysis.

The results of the regression analysis are shown in Table VII. Of the 96 countries in the sample 40 were deleted due to missing data. Each country is listed with an estimate of GDPGB84 based on the independent variables selected for the equation. Also shown are the residuals, a plot of the student's residual and Cook's D. Based on the r-squared value of .65 the independent variables explain 65 percent of the variation in GDPGB84. For each of the independent variables and the intercept a parameter estimate, a t-statistic and other information is provided. The F-value for the equation is 23.7 with a probability just under 100 percent. The degrees of freedom for the equation is 55. Table VIII summarizes some of this data as variables were added to the equation. The lack of fluctuation in the values of the parameter estimate for each variable confirmed that the independent variables have little or no correlation between themselves.

TABLE VII

RESULTS OF THE SECOND REGRESSION ANALYSIS

DEP VARIABLE: GDP3684

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	248.857	62.214234	23.706	0.0001
ERROR	51	133.845	2.624416		
C TOTAL	55	382.702			
	ROOT MSE	1.620005	R-SQUARE	0.6503	
	DEP MEAN	4.132143	ADJ R-SQ	0.6223	
	C.V.	38.73624			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR HO: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	2.092759	5.425	0.0001	0.000000
GDI3684	1	0.333721	9.248	0.0001	0.785640
YMEYSG	1	2.350e34	1.779	0.0812	0.156156
GDIGA84	1	0.068621	1.637	0.1079	0.138188
YETYSG	1	-0.399813	-0.357	0.7229	-0.031193

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	ISRAEL	3.100	4.205	-1.105	1.104	-1.001	** |
2	GREECE	4.100	3.244	0.855798	1.590	0.538	| * |
3	TAIWAN	.	.	.	.	.	
4	NICARAG	0.600000	2.276	-1.676	1.563	-1.072	** |
5	INDIA	3.600	3.955	-.354696	1.593	-0.223	|
6	HONDURAS	4.200	4.362	-.162453	1.592	-0.102	|
7	CAMEROON	7.000	5.814	1.186	1.594	0.744	| *
8	NIGERIA	3.800	6.053	-2.253	1.568	-1.437	** |
9	INDONES	7.700	.	.	.	.	
10	SUDAN	6.300	5.525	0.774754	1.573	0.492	| |
11	COSTAR	4.500	.	.	.	.	
12	BOLIVIA	3.700	2.167	1.533	1.545	0.992	| * |
13	SENEGAL	2.900	2.750	0.149504	1.585	0.094	|
14	SOMALIA	3.800	.	.	.	.	
15	EGYPT	8.400	7.650	0.750416	1.490	0.503	| * |
16	TOGO	3.000	4.401	-1.401	1.513	-1.257	** |
17	TUNISIA	7.000	6.003	0.997203	1.583	0.630	| * |
18	MOROCCO	5.000	.	.	.	.	
19	KOREA	8.600	7.703	0.896782	1.416	0.633	| * |
20	RWANDA	5.300	.	.	.	.	
21	GUATEM	5.000	4.507	0.493224	1.603	0.308	| |
22	AFGHAN	.	.	.	.	.	
23	MALAWI	5.100	4.190	0.910345	1.496	0.608	| * |
24	NIGER	3.400	4.187	-.787256	1.585	-0.497	|
25	SINGAPOR	8.500	.	.	.	.	
26	ELSALV	2.200	2.787	-.587485	1.595	-0.363	| |
27	MALI	7.100	4.166	2.934	1.594	1.841	| ***
28	PAKISTAN	3.000	.	.	.	.	
29	UPPERVOL	3.400	.	.	.	.	
30	BENIN	3.300	6.392	-3.092	1.576	-1.962	*** |
31	TURKEY	5.100	4.422	0.677574	1.596	0.425	|
32	YUGOSLV	5.500	4.350	1.150	1.590	0.723	| *
33	SPAIN	3.100	2.384	0.216302	1.577	0.137	|
34	PARAGUA	8.500	8.016	0.483801	1.540	0.314	|
35	VENEZUEL	4.100	4.123	-.022928	1.602	-0.014	|
36	IRAN	.	.	.	.	.	
37	MEXICO	6.400	5.326	1.074	1.593	0.674	| *
38	BRAZIL	7.600	4.368	3.232	1.584	2.040	| ****
39	ALGERIA	6.600	5.363	1.237	1.536	0.805	| *
40	PHILIPP	6.000	6.093	-.092508	1.548	-0.060	|
41	HONGKONG	9.900	.	.	.	.	
42	LIBYA	2.400	.	.	.	.	
43	ECUADOR	8.100	.	.	.	.	
44	COLOMBIA	5.400	4.424	0.976031	1.593	0.613	| *
45	THILAND	7.100	5.466	1.634	1.563	1.046	| **
46	MALAYSIA	7.700	6.377	1.323	1.576	0.839	| *
47	DOMINR	6.000	4.980	1.020	1.574	0.648	| *

TABLE VII (cont'd)

OBS	ID	ACTUAL	VALUE	RESIDUAL	RESIDUAL	RESIDUAL	-2-1-0 1 2
48	LIBERIA	0.900000	2.395	-1.495	1.526	-0.979	| * | |
49	IVORYCOA	5.700	6.363	-.665397	1.556	-0.423	| | |
50	MAURIT	7.400	5.113	2.287	1.456	1.570	| | *** |
51	CONGO	6.800	.	.	.	.	
52	SIERRAL	2.000	.	.	.	.	
53	PANAMA	4.700	3.263	1.437	1.565	0.918	| | * |
54	CHILE	1.900	2.893	-.992538	1.591	-0.624	| * | |
55	CHAD	-2.600	0.310334	-2.910	1.546	-1.882	| *** | |
56	URUGUAY	3.100	.	.	.	.	
57	MADAGAS	0.200000	.	.	.	.	
58	TANZANIA	4.000	4.444	-.444028	1.574	-0.282	| | |
59	UGANDA	-1.500	0.358301	-1.859	1.469	-1.266	| ** | |
60	ETHIOPIA	2.200	2.778	-.578261	1.592	-0.363	| | |
61	CAR	1.400	-.341379	1.741	1.525	1.142	| | ** |
62	ANGOLA	.	.	.	.	.	
63	GHANA	-.500000	0.028684	-.528684	1.501	-0.352	| | |
64	BANGLAD	4.100	.	.	.	.	
65	MOZAMBIQ	.	.	.	.	.	
66	PORTUGAL	4.300	2.671	1.629	1.468	1.247	| | ** |
67	BURMA	5.000	4.992	0.008043	1.568	0.005	| | |
68	SRILANKA	4.500	6.284	-1.784	1.572	-1.135	| ** | |
69	ZAIRE	-.200000	3.871	-4.071	1.526	-2.668	| ***** | |
70	ARGENTIN	1.500	2.954	-1.454	1.586	-0.916	| * | |
71	JAMAICA	-1.100	-.690365	-1.010	1.452	-0.695	| * | |
72	TRINIDAD	5.500	5.396	0.103672	1.537	0.067	| | |
73	ZAMBIA	0.900000	-.475964	1.376	1.473	0.934	| | * |
74	PERU	3.000	3.802	-.802365	1.561	-0.514	| * | |
75	PAPUA	2.000	.	.	.	.	
76	BURUNDI	3.500	.	.	.	.	
77	GUINEA	3.300	.	.	.	.	
78	LESOTHO	6.600	9.950	-3.350	1.420	-2.359	| **** | |
79	SOUTHAF	3.600	.	.	.	.	
80	SAUDIAR	3.600	.	.	.	.	
81	ZIMBAB	2.200	.	.	.	.	
82	IRAQ	.	.	.	.	.	
83	KUWAIT	2.100	.	.	.	.	
84	KENYA	5.500	3.621	1.879	1.593	1.179	| | | ** |
85	SYRIA	8.300	.	.	.	.	
86	NYEMEN	8.500	.	.	.	.	
87	LAOS	.	.	.	.	.	
88	VIETNAM	.	.	.	.	.	
89	BHUTAN	.	.	.	.	.	
90	LEBANON	.	.	.	.	.	
91	JORDAN	9.300	.	.	.	.	
92	NEPAL	2.700	.	.	.	.	
93	HAITI	3.400	4.587	-1.187	1.577	-0.753	| * | |
94	OMAN	5.800	.	.	.	.	
95	ADEN	.	.	.	.	.	
96	UAE	.	.	.	.	.	

SUM OF RESIDUALS 1.3873
SUM OF SQUARED RESIDUALS 133

TABLE VIII

REGRESSION MATRIX OF THE ECONOMIC GROWTH MODEL

EQUATION	INDEPENDENT VARIABLES				STATISTICS		
	GDIGB84	YMEYSG	GDIGA84	YETYSG	R-SQ	F	DF
1. GDPGB84=							
2.	.22 (6.97)				.39	43.5	76
3.	.22 (6.83)	-1.21 (-.85)			.40	23.4	71
4.	.31 (9.26)	1.73 (1.35)	.09 (2.22)		.61	30.8	62
5.	.33 (9.24)	2.35 (1.78)	.07 (1.64)	-.40 (-.36)	.65	23.7	55

NOTES:
1. SEE TEXT FOR DEFINITION OF VARIABLES.
2. ( ) = T STATISTIC.
3. R-SQ = CORRELATION COEFFICIENT.
4. F = F STATISTIC.
5. DF = DEGREES OF FREEDOM.

The resulting model was constructed:

GDPGB84=2.1 + .33 GDIGB84 + 2.35 YMEYSG + .07 GDIGA84 - .36 YETYSG

This model provides a gross indication through the signs (+ or -) that military expenditures are positively related to growth while social expenditures are negatively related to economic growth. Further analysis was conducted to divide the sample of 96 developing countries into relatively rich and poor groups through the use of factor and discriminant analysis.

C. RESULTS OF THE DISCRIMINANT ANALYSIS

In order to divide the 96 developing countries into two groups according to their overall level of development two further analytical steps were necessary. The first step involved another variable selection using a second factor analysis. The second step involved taking the variables produced by the factor analysis and using them to conduct a discriminant analysis.

Using the 35 variables contained in Table III which reflected levels of development as well as economic growth a second factor analysis was conducted. The results of this factor analysis, shown in Table IX, are in the form of a orthogonal transformation matrix. The program specified that 99 percent of the variance in the input variables could be accounted for by six factors. Factor one grouped variables

TABLE IX

RESULTS OF THE SECOND FACTOR ANALYSIS

	ROTATED FACTOR PATTERN					
	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR
YCGRY	92 *	3	15	2	10	-9
YCGCEY	90 *	-10	-5	20	16	11
YETYSG	71 *	-3	7	25	4	21
YMEYSG	63 *	-13	-29	-14	23	8
EXPG84	63 *	36 *	28	-21	-4	21
YGGNPPB	1	64 *	13	15	-1	-4
GDPGB84	-4	84 *	-8	-30	-15	-16
GNPG78	32	77 *	0	24	5	16
GDIGB84	-16	67 *	11	-35 *	-8	-40*
GDIGA84	0	60 *	-29	-8	-11	52*
YIYSG	-21	59 *	11	9	15	2
GDSVG84	-5	58 *	42 *	-35 *	19	-5
YLFPISG	15	13	81 *	31	-2	5
YGGNPPA	17	3	81 *	35 *	-6	-19
YLFPSSG	-4	-3	60 *	24	29	-7
FPER78	30	38 *	-41 *	-12	16	-16
FPPER78	36 *	-20	-49 *	-11	-11	6
UPGB84	-25	-13	-57 *	-4	-27	33
YPCYSG	-20	-4	37 *	73 *	23	-1
YGCYSG	33	-3	12	69 *	9	5
YLFPAGSG	-12	7	29	49 *	7	-5
LFGB84	-32	-2	-17	-62 *	24	18
LFGA84	4	11	-12	-70 *	20	14
UPPA84	17	0	14	0	95 *	-10
UPPB84	15	4	10	-3	93 *	15
DSCG84	40 *	4	17	2	30	65*
PDPG78	38 *	-27	-23	-17	1	65*
UPGA84	-7	-3	-26	-38 *	-13	58*

that reflect energy consumption, life expectancy in 1982, calories per capita, merchandise imports and exports, and urbanization. Factor two depicted growth in GDP, industry, services, manufacturing, and domestic investment. Factor three was predominated by variables that reflected the growth of exports. Factor four consisted primarily of labor shifts in agriculture and industry. Factor five consisted solely of fuels, minerals and metals exports. Factor six reflected the labor shift in services and also the two test variables, YMEYSG and YETYSG. Only 43 countries were used by the program. The remaining countries were omitted due to missing data. The highest loading variables in each of the factors were selected for use in the subsequent discriminant analysis.

A discriminant analysis was run using the six variables from the factor analysis. These variables included ECPER78, GDPGB84, EB84, YLFPAGSG, FEB84 and YLFPSSG. The results of the discriminant analysis are shown in Table X. In the first column the table listed the 57 countries for which data was available according to the variables selected. The second column listed the original group, 0 or 1, in which each country was placed on an 'a priori' basis. The third column listed the group into which each country was placed by the program based on the six variables used for the analysis. An asterisk, added by the program, indicated that the group status of a country was changed from its 'a priori' designation. The last two columns indicate the posterior probability

TABLE X

RESULTS OF THE DISCRIMINANT ANALYSIS

COUNTRY	FROM GROUP	CLASSIFIED INTO GROUP		POSTERIOR PROBABILITY OF MEMBERSHIP IN GROUP: 0	1
ISRAEL	0	0		0.5670	0.4330
GREECE	1	1		0.3012	0.6988
NICARAG	0	0		0.9209	0.0791
INDIA	1	0	*	0.7707	0.2293
HONDURAS	0	0		0.8155	0.1845
CAMEROON	0	1	*	0.3829	0.6171
INDONES	1	1		0.0937	0.9063
SUDAN	0	1	*	0.4800	0.5200
COSTAR	0	0		0.7922	0.2078
SENEGAL	0	0		0.7928	0.2072
EGYPT	1	1		0.1284	0.8716
TOGO	0	0		0.7688	0.2312
TUNISIA	0	1	*	0.2576	0.7424
MOROCCO	0	1	*	0.4836	0.5164
KOREA	1	1		0.2210	0.7790
GUATEM	0	0		0.6643	0.3357
MALAWI	0	0		0.7557	0.2443
NIGER	0	0		0.5933	0.4067
SINGAPOR	0	0		0.9434	0.0566
ELSALV	0	0		0.8857	0.1143
UPPERVOL	0	0		0.8526	0.1474
TURKEY	0	1	*	0.4633	0.5367
YUGOSLV	0	1	*	0.2401	0.7599
SPAIN	1	1		0.4081	0.5919
VENEZUEL	1	1		0.0624	0.9376
BRAZIL	1	1		0.1874	0.8126
ALGERIA	1	1		0.0604	0.9396
PHILIPP	1	1		0.4517	0.5483
HONGKONG	0	0		0.5936	0.4064
LIBYA	1	1		0.4629	0.5371
COLOMBIA	1	1		0.4208	0.5792
THILAND	1	1		0.4637	0.5363
MALAYSIA	1	1		0.3239	0.6761
DOMINR	0	0		0.7999	0.2001
LIBERIA	0	0		0.9121	0.0879
IVORYCOA	0	0		0.7212	0.2788
CONGO	0	1	*	0.2915	0.7085
SIERRAL	0	0		0.8850	0.1150
PANAMA	0	0		0.5850	0.4150
CHILE	0	0		0.6672	0.3328
URUGUAY	0	0		0.7473	0.2527
MADAGAS	0	0		0.9522	0.0478
TANZANIA	0	0		0.7612	0.2388
ETHIOPIA	0	0		0.8939	0.1061
CAR	0	0		0.9507	0.0493
PORTUGAL	0	0		0.8399	0.1601
SRILANKA	0	0		0.7989	0.2011
ARGENTIN	1	0	*	0.7751	0.2249
JAMAICA	0	0		0.8004	0.1996
TRINIDAD	0	1	*	0.0501	0.9499
PERU	0	0		0.7489	0.2511
SAUDIAR	1	0	*	0.8696	0.1304
KUWAIT	1	1		0.0058	0.9942
KENYA	0	0		0.5641	0.4359
NYEMEN	0	0		0.7010	0.2990
JORDAN	1	1		0.2121	0.7879
NEPAL	0	0		0.8964	0.1036

* MISCLASSIFIED OBSERVATION

of placement by the program into either group 0 or group 1. As indicated in Chapter II, the standard for this study was to have the placement probability for most of the countries above 80 percent. As shown in the table only 21 of the 57 countries meet the 80 percent criterion. At this point another process, the stepwise discriminant analysis, was applied to the 35 selected variables in an attempt to achieve more acceptable results for the discriminant analysis.

The stepwise discriminant analysis used a selection process to find which variables among the 35 variables used for this segment of the study that best showed the differences between the country groupings. The 35 variables were divided and put into three stepwise discriminant analysis programs since all of the variables could not be handled by a single program. The results of the three programs are shown in Table XI. Each summary listed the results for the corresponding input variables. The summary also included data on the number of steps taken in the analysis to find the best discriminating variables for the two groups. Wilks' lambda, which is the program's primary selection tool, the F-statistic and the r-squared values for each step are also included.

Since three programs were run in the stepwise discriminant analysis, action was deemed necessary to ensure that correlation between the output variables was minimized prior to their use in a final discriminant analysis. The correlation analysis shown in Table XII was consulted. This table

TABLE XI

RESULTS OF THE THREE
STEPWISE DISCRIMINANT PROGRAMS

1. STEPWISE SELECTION: SUMMARY

STEP	VARIABLE ENTERED	VARIABLE REMOVED	PARTIAL R**2	F STATISTIC	PROB > F	WILKS' LAMBDA	PROB > LAMBDA
1	MTZ78		0.4106	27.863	0.0001	0.58942003	0.0000
2	SGB34		0.0814	3.454	0.0706	0.54146013	0.0000

2. STEPWISE SELECTION: SUMMARY

STEP	VARIABLE ENTERED	VARIABLE REMOVED	PARTIAL R**2	F STATISTIC	PROB > F	WILKS' LAMBDA	PROB > LAMBDA
1	GDPB84		0.4588	46.620	0.0001	0.54123057	0.0000
2	GDPGB34		0.0662	3.828	0.0556	0.50539393	0.0000

3. STEPWISE SELECTION: SUMMARY

STEP	VARIABLE ENTERED	VARIABLE REMOVED	PARTIAL R**2	F STATISTIC	PROB > F	WILKS' LAMBDA	PROB > LAMBDA
1	GDPB84		0.1411	9.034	0.0040	0.85891863	0.0040
2	GDPGB34		0.1127	6.857	0.0114	0.76214535	0.0007
3	PDPB73		0.0990	5.822	0.0193	0.68671283	0.0002
4	YLFPAGSG		0.0566	3.117	0.0833	0.64737389	0.0001
5	YETYS3		0.0442	2.360	0.1307	0.61922164	0.0001

TABLE XII

RESULTS OF THE CORRELATION ANALYSIS

CORRELATIONS

	UPPB84	GDPGB84	PDPB78	YLFPAGSG	YETYSG	MTZ78	SGB84	GDPB84
UPPB84	100 *	14	-15	-43 *	11	73 *	0	49*
GDPGB84	14	100 *	27	-21	-13	13	88 *	-2
PDPB78	-15	27	100 *	-13	-40 *	-41 *	36	-40*
YLFPAGSG	-43 *	-21	-13	100 *	22	-34	-3	-27
YETYSG	11	-13	-40 *	22	100 *	16	-13	13
MTZ78	73 *	13	-41 *	-34	16	100 *	6	87*
SGB84	0	88 *	36	-3	-13	6	100 *	-1
GDPB84	49 *	-2	-40 *	-27	13	87 *	-1	100*
GDIGB84	13	81 *	38	-25	-12	4	73 *	-1
YMEYSG	-26	21	33	-23	-32	-29	19	-31
FPER78	44 *	24	-16	-32	35	28	18	16
YLFPISG	37	33	-9	35	24	42 *	31	15
YLFPSSG	-1	0	-26	23	40	10	-11	0
GNPG78	49 *	29	-39	1	29	57 *	15	28
EXPG84	25	36	21	-11	10	-1	17	-24
DSGG84	14	37	37	12	22	-14	25	-27
LFGB84	-24	38	58 *	-22	-8	-39	30	-32
UPGB84	-48 *	-1	48 *	0	9	-49 *	-2	-41*
EPPER78	-39	-4	10	-14	-6	-39	-4	-42*
ECPER78	77 *	2	-44 *	-23	32	81 *	-7	56*
ZGB78	53 *	67 *	30	-42 *	6	36	60 *	20
LE84	53 *	21	-56 *	-6	20	67 *	10	44*
AGB84	-13	47 *	30	-51 *	-23	-20	25	-22
IGB84	22	88 *	3	-22	-16	19	62 *	5
MGB84	25	83 *	15	-32	0	27	67 *	11
GDSB84	32	46 *	1	-46 *	16	39	23	35
EB84	23	35	22	-10	11	-3	17	-25
FEB84	17	21	50 *	-25	-4	-7	22	-14
DPCEB84	-67 *	-26	9	20	-13	-58 *	-13	-45*
TEB84	29	22	-26	26	16	31	22	32
MEL84	52 *	14	-51 *	-17	28	81 *	-1	67*
DMEB84	55 *	-10	-58 *	2	7	62 *	-29	57*
SIMR	-43 *	-34	51 *	3	-13	-62 *	-21	-37
SCP	77 *	22	-30	-14	31	64 *	14	34
SPW	63 *	44 *	-5	-10	11	61 *	47 *	37

was produced by the second factor analysis. Correlations above 50 were considered unacceptable. The variable selection began with the elimination of MTZ78 which had a correlation of 73 with UPPB84 and one of 87 with GDPB84. The only other correlation above 50 was between SGB84 and GDPGB84. The choice between the two variables was based on data availability. GDPGB84 was selected since its data was available for 84 countries while data for SGB84 was available for only 72 countries. With the loss of SGB84 and MTZ78 a decision was made to include FPER78 into the group of variables for the subsequent discriminant analysis. This decision was based on the need for an additional variable in the group to reflect the possibilities for the human condition. In sum, the variables selected for the discriminant analysis now included UPPB84, GDPGB84, PDPB78, YLFPAGSG, YETYSG, GDPB84 and FPER78.

The results of the discriminant analysis using the variables listed above are shown in Table XIII. The analysis produced 67 countries with 48 countries placed in group 0 and 19 countries placed in group 1. Only 13 countries had a probability of placement below 80 percent. In sum, the results of the discriminant analysis were considered acceptable.

The final phase of the discriminant analysis was to determine the economic size represented by the two groups. This determination was made through the examination of the mean values of the variables used to discriminate between the two

TABLE III

RESULTS OF THE SECOND DISCRIMINANT ANALYSIS

COUNTRY	FROM GROUP	CLASSIFIED INTO GROUP		POSTERIOR PROBABILITY OF MEMBERSHIP IN GROUP: 0	1
ISRAEL	0	0		0.9585	0.0415
GREECE	1	0	*	0.5841	0.4159
NICARAG	0	0		0.9646	0.0354
INDIA	1	1		0.0353	0.9647
HONDURAS	0	0		0.9609	0.0391
CAMEROON	0	0		0.7930	0.2070
NIGERIA	1	1		0.1561	0.8439
SUDAN	0	0		0.9627	0.0373
BOLIVIA	0	0		0.9584	0.0416
SENEGAL	0	0		0.9326	0.0674
EGYPT	1	1		0.4530	0.5470
TOGO	0	0		0.9623	0.0377
TUNISIA	0	0		0.8756	0.1244
MOROCCO	0	0		0.8562	0.1438
KOREA	1	1		0.0187	0.9813
GUATEM	0	0		0.7594	0.2406
MALAWI	0	0		0.9801	0.0199
NIGER	0	0		0.9088	0.0912
SINGAPOR	0	0		0.6253	0.3747
ELSALV	0	0		0.9318	0.0682
MALI	0	0		0.8865	0.1135
UPPERVOL	0	0		0.9440	0.0560
BENIN	0	0		0.9547	0.0453
TURKEY	0	1	*	0.3501	0.6499
YUGOSLV	0	1	*	0.1724	0.8276
SPAIN	1	1		0.0006	0.9994
PARAGUA	0	1	*	0.3781	0.6219
VENEZUEL	1	1		0.0313	0.9687
MEXICO	1	1		0.0003	0.9997
BRAZIL	1	1		0.0000	1.0000
ALGERIA	1	1		0.3344	0.6656
PHILIPP	1	1		0.2668	0.7332
LIBYA	1	1		0.4166	0.5834
ECUADOR	0	1	*	0.3057	0.6943
COLOMBIA	1	1		0.1559	0.8441
THILAND	1	0	*	0.5369	0.4631
MALAYSIA	1	0	*	0.8522	0.1478
DOMINR	0	0		0.9023	0.0977
LIBERIA	0	0		0.9917	0.0083
IVORYCOA	0	0		0.9609	0.0391
MAURIT	0	0		0.9607	0.0393
SIERRAL	0	0		0.9862	0.0138
PANAMA	0	0		0.9655	0.0345
CHILE	0	0		0.6414	0.3586
CHAD	0	0		0.9916	0.0084
TANZANIA	0	0		0.9944	0.0056
UGANDA	0	0		0.9808	0.0192
ETHIOPIA	0	0		0.9475	0.0525
CAR	0	0		0.9662	0.0338
GHANA	0	0		0.7987	0.2013
PORTUGAL	0	0		0.9651	0.0349
BURMA	0	0		0.7748	0.2252
SRILANKA	0	0		0.9498	0.0502
ZAIRE	0	0		0.9996	0.0004
ARGENTIN	1	1		0.1178	0.8822
JAMAICA	0	0		0.9908	0.0092
TRINIDAD	0	0		0.8490	0.1510
ZAMBIA	0	0		0.9967	0.0033
PERU	0	0		0.9004	0.0996
LESOTHO	0	0		0.9950	0.0050
SAUDIAR	1	1		0.0072	0.9928
ZIMBAB	0	0		0.9966	0.0034
KENYA	0	0		0.9291	0.0709
SYRIA	1	1		0.1238	0.8762
JORDAN	1	1		0.0491	0.9509
NEPAL	0	0		0.9742	0.0258
HAITI	0	0		0.9920	0.0080

* MISCLASSIFIED OBSERVATION

groups. As shown in Table XIV, the mean values of GDP, the growth of GDP, and urbanization are higher for group 1 than for group 0. So for the purposes of this study countries in group 1 were designated more economically dynamic while the countries in group 0 were designated less economically dynamic. In sum, the group membership of each country in this phase of the study and the identity of that group was considered certain enough to provide a basis for the test of the hypothesis using the model for economic growth.

D. RESULTS OF THE TEST OF THE MODEL

The economic growth model derived in Section B of this chapter was tested in order to provide evidence to support the hypothesis. This evidence would be in the algebraic sign of the test variables, YMEYSG and YETYSG. The model was tested by applying it to each of the two groups, the less economically dynamic countries or group 0 and the more economically dynamic countries or group 1, found through the discriminant analysis. In order to test the uniqueness of the Latin American case the model was applied to the remaining group 0 and group 1 countries respectively. The results of each test were then compared. Another test of the Latin American case involved the addition of a dummy variable into the economic growth model and testing the group 0 and group 1 countries again.

The results of the model test for the 45 countries in group 0 are shown in Table XV. In the variable and parameter

TABLE XIV

RESULTS OF THE GROUP MEANS ANALYSIS

VARIABLE	GROUP 0	GROUP 1
UPPB84	34.79	52.76
GDPGB84	3.68	5.60
PDPB78	25.26	15.79
YLFPAGSG	.08	-.79
YETYSG	.08	.01
PPER78	99.29	110.33
GDPB84	9049.85	84572.67

TABLE XV

RESULTS OF THE REGRESSION ON ALL GROUP 0 COUNTRIES

DEP VARIABLE: GDPGB84

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	163.773	40.943347	13.832	0.0001
ERROR	34	100.641	2.960029		
C TOTAL	38	264.414			
ROOT MSE		1.720473	R-SQUARE	0.6194	
DEP MEAN		3.558574	ADJ R-SQ	0.5746	
C.V.		48.34183			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR HO: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	2.043234	4.453	0.0001	0.000000
GDIGB84	1	0.312176	7.111	0.0001	0.771723
YMEYSG	1	3.236297	2.093	0.0434	0.242989
GDIGA84	1	0.047547	0.870	0.3902	0.094843
YETYSG	1	-0.360613	-0.262	0.7950	-0.030511

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	ISRAEL	3.100	4.897	-1.797	1.118	-1.607	***
2	NICARAG	0.600000	2.080	-1.480	1.640	-0.902	*
3	HONDURAS	4.200	4.039	0.160507	1.680	0.096	
4	CAMEROON	7.000	5.366	1.634	1.676	0.975	*
5	SUDAN	6.300	5.331	0.968835	1.657	0.585	*
6	BOLIVIA	3.700	1.934	1.766	1.613	1.091	**
7	SENEGAL	2.900	2.641	0.259189	1.672	0.155	
8	TOGO	3.000	4.565	-1.565	1.582	-0.989	*
9	TUNISIA	7.000	5.640	1.360	1.661	0.819	*
10	MOROCCO	5.000	.	.	.	.	
11	GUATEM	5.000	4.170	0.830167	1.690	0.491	
12	MALAWI	5.100	3.865	1.235	1.507	0.820	*
13	NIGER	3.400	3.826	-.425737	1.666	-0.255	
14	SINGAPOR	8.500	.	.	.	.	
15	ELSALV	2.200	2.644	-.443858	1.688	-0.263	
16	MALI	7.100	3.906	3.194	1.673	1.904	***
17	UPPERVOL	3.400	.	.	.	.	
18	BENIN	3.300	5.963	-2.663	1.644	-1.620	***
19	MALAYSIA	7.700	5.953	1.747	1.657	1.054	**
20	DOMINR	6.000	4.417	1.583	1.645	0.962	*
21	LIBERIA	0.900000	2.369	-1.469	1.576	-0.932	*
22	IVORYCOA	5.700	5.905	-.204858	1.631	-0.126	
23	MAURIT	7.400	5.342	2.058	1.513	1.360	**
24	SIERRAL	2.000	.	.	.	.	
25	PANAMA	4.700	2.983	1.717	1.643	1.045	**
26	CHILE	1.900	2.636	-.735999	1.679	-0.438	
27	CHAD	-2.300	0.264989	-2.565	1.631	-1.756	***
28	TANZANIA	4.000	4.353	-.353231	1.658	-0.213	
29	UGANDA	-1.500	0.423293	-1.923	1.527	-1.263	**
30	ETHIOPIA	2.200	2.635	-.404769	1.684	-0.240	
31	CAR	1.400	-.280440	1.680	1.606	1.046	**
32	GHANA	-.500000	0.066026	-.566026	1.568	-0.361	
33	PORTUGAL	4.500	2.231	2.269	1.500	1.512	***
34	BURMA	5.000	4.471	0.528767	1.639	0.323	
35	SRILANKA	4.500	5.852	-1.352	1.630	-0.829	*
36	ZAIRE	-.200000	3.173	-3.373	1.597	-2.115	****
37	JAMAICA	-1.100	-.105577	-.994423	1.473	-0.675	*
38	TRINIDAD	5.500	5.165	0.335371	1.590	0.211	
39	ZAMBIA	0.900000	-.371392	1.271	1.515	0.839	*
40	PERU	3.000	3.849	-.849229	1.644	-0.516	*
41	LESOTHO	6.800	9.052	-2.452	1.404	-1.746	***
42	ZIMBAB	2.200	.	.	.	.	
43	KENYA	5.500	3.357	2.143	1.673	1.277	**
44	NEPAL	2.700	.	.	.	.	
45	HAITI	3.400	4.212	-.812135	1.651	-0.492	

SUM OF RESIDUALS 3.3972

SUM OF SQUARED RESIDUALS 10

section of the table the sign of YMEYSG was positive and the t-statistic was significant with a value of 2.098. The value of YETYSG was negative with a t-statistic of only -.262. This t-statistic value was well below the 2.00 standard set for the study making the YETYSG variable not statistically significant in determining GDPGB84. This meant that the effect of YETYSG on economic growth could not be identified with any certainty using this text.

The results of the model test for the countries in group 1 are shown in Table XVI. For this test the sign of YMEYSG was negative and the t-statistic was significant with a value of -3.217. The sign of YETYSG was also negative but its t-statistic was -1.177. Again the effect of YETYSG on economic growth could not be determined.

Since the relationship of YETYSG to economic growth could not be determined using the above test another model was introduced. This model simply looked at the relationship between the two test variables with YETYSG as the dependent variable and YMEYSG as the independent variable. This model was then tested on group 0 and group 1 countries.

The results of the second model test on the group 0 countries were as follows (t-statistics in parenthesis):

$$\underset{\text{r-squared} = .10}{\text{YETYSG} = .094 + \underset{(2.176)}{.465}\ \text{YMEYSG}}$$

TABLE XVI

RESULTS OF THE REGRESSION ON ALL GROUP 1 COUNTRIES

DEP VARIABLE: GDPG884

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	48.292423	12.073106	14.916	0.0005
ERROR	9	7.284720	0.809413		
C TOTAL	13	55.577143			
ROOT MSE		0.899674	R-SQUARE	0.8689	
DEP MEAN		5.414286	ADJ R-SQ	0.8107	
C.V.		16.61667			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR H0: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	1.518514	2.417	0.0388	0.000000
GDIGB84	1	0.346391	5.584	0.0003	0.704710
YMEYSG	1	-8.532925	-3.217	0.0105	-0.459146
GDIGA84	1	0.163636	3.162	0.0115	0.427476
YETYSG	1	-2.121129	-1.027	0.3313	-0.136951

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	INDIA	3.600	4.503	-.902525	0.832355	-1.084	**
2	NIGERIA	3.800	3.939	-.138750	0.601736	-0.314	
3	KOREA	8.600	8.304	0.296421	0.436942	0.673	*
4	TURKEY	5.100	4.786	0.314426	0.810182	0.388	
5	YUGOSLV	5.500	4.390	1.110	0.798010	1.391	**
6	SPAIN	3.100	3.907	-.807118	0.692042	-1.166	**
7	PARAGUA	8.500	9.672	-1.172	0.606079	-1.934	***
8	VENEZUEL	4.100	4.919	-.819923	0.840076	-0.975	*
9	MEXICO	6.460	5.780	0.619775	0.813785	0.762	*
10	BRAZIL	7.600	6.342	1.258	0.674671	1.865	***
11	ALGERIA	6.600	6.151	0.443755	0.703169	0.634	*
12	PHILIPP	6.000	5.751	0.249403	0.681748	0.366	
13	ECUADOR	8.100	.	.	.	.	
14	COLOMBIA	5.400	5.543	-.143203	0.805411	-0.178	
15	ARGENTIN	1.500	1.764	-.264354	0.679194	-0.389	
16	SAUDIAR	3.600	.	.	.	.	
17	SYRIA	8.300	.	.	.	.	
18	JORDAN	9.300	.	.	.	.	

SUM OF RESIDUALS 1.6431

SUM OF SQUARED RESIDUALS 7.

Though YMEYSG explains only 10 percent of the variation in YETYSG its sign was a positive sign and statistically significant.

The results of the second model test on the group 1 countries were as follows:

$$YETYSG = .021 - .591\ YMEYSG$$
$$(-3.172)$$
$$r\text{-squared} = .59$$

In this model YMEYSG explains 59 percent of the variation in YETYSG. The negative sign of YMEYSG indicated an inverse relationship between the two variables which was statistically significant.

The first test of the Latin American case involved comparing the Latin American group 0 countries with the remaining group 0 countries using the economic growth model. The results of the test on the Latin American group 0 countries are shown in Table XVIII. In this test the resulting values for both YMEYSG and YETYSG were not statistically significant with t-statistic values of .554 and -.350 respectively. The results of the test on the remaining group 0 countries are shown in Table XVIII. Again the values of both test variables were not statistically significant with lot t-statistic values.

The second test of the Latin American case involved the comparison of the Latin American group 1 countries with the remaining group 1 countries. The results of this test are

TABLE XVII

RESULTS OF THE REGRESSION ON LATIN AMERICAN GROUP 0 COUNTRIES

DEP VARIABLE: GDPGB84

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	38.401055	9.600264	7.113	0.0130
ERROR	7	9.448112	1.349730		
C TOTAL	11	47.849167			
ROOT MSE		1.161779	R-SQUARE	0.8025	
DEP MEAN		3.258333	ADJ R-SQ	0.6897	
C.V.		35.65562			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR H0: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	0.910733	1.032	0.3365	0.000000
CDIGB84	1	0.422877	4.545	0.0027	1.024384
YMEYSG	1	2.438523	0.554	0.5966	0.103544
GDICA84	1	0.185369	2.115	0.0722	0.427930
YETYSG	1	-0.663979	-0.350	0.7369	-0.065237

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	NICARAG	0.600000	2.209	-1.609	0.966725	-1.664	| ***| |
2	HONDURAS	4.200	4.740	-.539870	0.928125	-0.582	| *| |
3	BOLIVIA	3.700	1.998	1.702	0.813014	2.093	| |**** |
4	GUATEM	5.000	4.752	0.248013	1.070	0.232	| | |
5	ELSALV	2.200	2.121	0.078945	1.048	0.075	| | |
6	DOMINR	6.000	5.784	0.215592	0.859469	0.251	| | |
7	PANAMA	4.700	3.548	1.152	0.906007	1.272	| |** |
8	CHILE	1.900	2.889	-.988580	1.090	-0.907	| *| |
9	JAMAICA	-1.100	-1.176	0.076173	0.482241	0.158	| | |
10	TRINIDAD	5.500	4.861	0.638505	0.820893	0.778	| |* |
11	PERU	3.000	3.059	-.059024	0.607615	-0.097	| | |
12	HAITI	3.400	4.315	-.914950	0.851785	-1.074	| **| |

SUM OF RESIDUALS 9.3258

SUM OF SQUARED RESIDUALS 9.4

TABLE XVIII

RESULTS OF THE REGRESSION ON THE REMAINING GROUP 0 COUNTRIES

DEP VARIABLE: GDPG884

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	130.194	32.549373	8.444	0.0003
ERROR	22	84.304226	3.854738		
C TOTAL	26	214.499			

ROOT MSE	1.963349	R-SQUARE	0.6056
DEP MEAN	3.692593	ADJ R-SQ	0.5339
C.V.	53.16992		

VARIABLE	DF	PARAMETER ESTIMATE	T FOR HO: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	2.163645	3.675	0.0013	0.000000
GDIG884	1	0.305681	5.197	0.0001	0.755071
YMEYSG	1	3.244764	1.737	0.0956	0.261134
GDIGA84	1	0.017335	0.220	0.8212	0.032833
YETYSG	1	0.221572	0.218	0.9069	0.018060

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	ISRAEL	3.100	5.202	-2.102	1.210	-1.733	*** |
2	CAMEROON	7.000	5.210	1.790	1.900	0.942	| * |
3	SUDAN	6.300	5.418	0.881864	1.866	0.472	| |
4	SENEGAL	2.000	2.746	-0.152039	1.891	-0.080	| |
5	TOGO	3.000	4.030	-1.030	1.741	-0.936	| * |
6	TUNISIA	7.000	5.816	1.284	1.871	0.740	| |
7	MOROCCO	5.000	.	.	.	.	| |
8	MALAWI	5.100	3.361	1.739	1.602	1.085	| ** |
9	NIGER	3.400	3.852	-0.451674	1.882	-0.240	| |
10	SINGAPOR	3.500	.	.	.	.	| |
11	MALI	7.100	3.784	3.316	1.893	1.751	| | *** |
12	UPPERVOL	3.400	.	.	.	.	| |
13	BENIN	3.200	5.363	-2.563	1.838	-1.394	| ** |
14	MALAYSIA	7.700	5.906	1.794	1.877	0.956	| * |
15	LIBERIA	3.900000	2.712	-1.812	1.741	-1.041	| ** |
16	IVORYCOA	5.700	5.771	-0.070928	1.840	-0.039	| |
17	MAURIT	7.400	5.547	1.853	1.654	1.120	| | ** |
18	SIERRAL	2.300	.	.	.	.	| |
19	CHAD	-2.000	0.316989	-2.319	1.834	-1.592	| *** |
20	TANZANIA	4.300	4.263	-0.263223	1.876	-0.140	| |
21	UGANDA	-1.300	0.412535	-1.713	1.650	-1.032	| ** |
22	ETHIOPIA	2.200	2.514	-0.314239	1.904	-0.166	| |
23	CAR	1.400	-1.953860	1.595	1.802	0.885	| * |
24	GHANA	-.5000000	0.216695	-.716695	1.753	-0.409	| |
25	PORTUGAL	4.500	2.587	2.113	1.593	1.326	| | ** |
26	BURMA	5.000	4.393	0.607250	1.843	0.330	| |
27	SRILANKA	4.500	5.606	-1.106	1.813	-0.610	| * |
28	ZAIRE	-.2000000	2.900	-3.100	1.765	-1.737	| *** |
29	ZAMBIA	3.900000	-.275493	1.175	1.553	0.754	| * |
30	LESOTHO	3.600	5.372	-1.772	1.549	-1.273	| ** |
31	ZIMBAB	2.200	.	.	.	.	| |
32	KENYA	5.500	3.165	2.335	1.886	1.238	| | ** |
33	NEPAL	2.700	.	.	.	.	| |

SUM OF RESIDUALS 2.1094
SUM OF SQUARED RESIDUALS 84.

shown in Table XIX. The values of YMEYSG and YETYSG were not statistically significant with t-statistic values of -.951 and -.093 respectively. The results of the remaining group 1 countries are shown in Table XX. The value for YMEYSG for this test was negative and statistically significant with a t-statistic value of -2.049. The value of YETYSG was not statistically significant.

The third test for the uniqueness of the Latin American case involved the use of a dummy variable. The dummy variable was introduced as an independent variable in the economic growth model with a value of 0 for Latin American countries and 1 for all other countries. The results of the test for all 45 group 0 countries are shown in Table XXI. The t-statistic value for the dummy variable was -.222 which indicated that there was no structural difference between the Latin American group 0 countries and the remaining group 0 countries.

The results of the dummy variable test for all the group 1 countries are shown in Table XXII. The t-statistic for the dummy variable was below 2.000 again. This indicated that there was also no structural difference between the Latin American group 1 countries and the remaining group 1 countries.

TABLE XIX

RESULTS OF THE REGRESSION ON THE LATIN AMERICAN GROUP 1 COUNTRIES

DEP VARIABLE: GDPGB84

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	38.401055	9.600264	7.113	0.0130
ERROR	7	9.448112	1.349730		
C TOTAL	11	47.849167			
ROOT MSE		1.161779	R-SQUARE	0.8025	
DEP MEAN		3.258333	ADJ R-SQ	0.6897	
C.V.		35.65562			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR HO: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	0.910733	1.032	0.3365	0.000000
CDIGB84	1	0.422677	4.545	0.0027	1.024384
YMEYSG	1	2.438523	0.554	0.5966	0.103544
CDIGA84	1	0.185969	2.115	0.0722	0.427930
YETYSG	1	-0.663979	-0.350	0.7369	-0.065237

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	NICARAG	0.600000	2.209	-1.609	0.966725	-1.664	***
2	HONDURAS	4.200	4.740	-.539870	0.928125	-0.582	*
3	BOLIVIA	3.700	1.998	1.702	0.813014	2.093	****
4	GUATEM	5.000	4.752	0.248013	1.070	0.232	
5	ELSALV	2.200	2.121	0.078945	1.048	0.075	
6	DOMINR	6.000	5.784	0.215592	0.859469	0.251	
7	PANAMA	4.700	3.548	1.152	0.906007	1.272	**
8	CHILE	1.900	2.389	-.488580	1.090	-0.907	*
9	JAMAICA	-1.100	-1.176	0.076173	0.482241	0.158	
10	TRINIDAD	5.500	4.861	0.638505	0.820893	0.778	*
11	PERU	3.000	3.059	-.059024	0.607615	-0.097	
12	HAITI	3.400	4.315	-.914950	0.851785	-1.074	**
SUM OF RESIDUALS			9.3258				
SUM OF SQUARED RESIDUALS			9.4				

TABLE XX

RESULTS OF THE REGRESSION ON THE
REMAINING GROUP 1 COUNTRIES

DEP VARIABLE: GDPGR84

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	21.084714	5.271178	7.736	0.0622
ERROR	3	2.044036	0.681345		
C TOTAL	7	23.128750			
ROOT MSE		0.825436	R-SQUARE	0.9116	
DEP MEAN		5.287500	ADJ R-SQ	0.7938	
C.V.		15.61109			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR H0: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	0.538207	0.502	0.6504	0.000000
GDIGR84	1	0.477614	4.536	0.0201	0.915932
YMEYSG	1	-8.315835	-2.049	0.1328	-0.554811
GDIGA84	1	0.164125	3.091	0.0537	0.630209
YETYSG	1	-0.578435	-0.183	0.8668	-0.049827

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	INDIA	3.600	4.417	-.816939	0.726831	-1.124	| ** | |
2	NIGERIA	3.800	4.178	-.377975	0.284454	-1.329	| ** | |
3	KOREA	8.600	8.686	-.086308	0.133397	-0.647	| * | |
4	TURKEY	5.100	4.811	0.289336	0.720096	0.402	| | |
5	YUGOSLV	5.500	4.527	0.972849	0.706434	1.377	| |** |
6	SPAIN	3.100	3.223	-.122758	0.442550	-0.277	| | |
7	ALGERIA	6.600	6.822	-.221557	0.380148	-0.583	| * | |
8	PHILIPP	6.000	5.637	0.363352	0.243091	1.495	| |** |
9	SAUDIAR	3.600	.	.	.	.	
10	SYRIA	8.800	.	.	.	.	
11	JORDAN	9.300	.	.	.	.	

SUM OF RESIDUALS 2.4424
SUM OF SQUARED RESIDUALS 2.0

TABLE XXI

RESULTS OF THE REGRESSION ON ALL GROUP 0 COUNTRIES USING THE DUMMY VARIABLE

DEP VARIABLE: GDPGB84

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	5	163.917	32.783376	10.765	0.0001
ERROR	33	100.497	3.045373		
C TOTAL	38	264.414			
ROOT MSE		1.745101	R-SQUARE	0.6199	
DEP MEAN		3.558974	ADJ R-SQ	0.5623	
C.V.		49.03362			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR HO: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	2.136135	3.378	0.0019	0.000000
GDPGB34	1	0.313508	6.975	0.0001	0.775017
YMEYSG	1	3.269797	2.080	0.0454	0.245504
GDPGA84	1	0.046529	0.837	0.4088	0.092807
YETYSG	1	-0.353204	-0.256	0.7992	-0.030307
DUM	1	-0.133501	-0.217	0.8295	-0.023664

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	ISRAEL	3.100	4.88	-1.782	1.132	-1.574	***
2	NICARAG	0.600000	2.16	-1.561	1.622	-0.962	*
3	HONDURAS	4.200	4.13	0.069930	1.652	0.042	
4	CAMEROON	7.000	5.32	1.671	1.691	0.988	*
5	SUDAN	6.300	5.30	0.996106	1.676	0.594	*
6	BOLIVIA	3.700	2.01	1.686	1.600	1.054	**
7	SENEGAL	2.900	2.60	0.298402	1.687	0.177	
8	TOGO	3.000	4.52	-1.525	1.594	-0.957	*
9	TUNISIA	7.000	5.61	1.390	1.679	0.828	*
10	MOROCCO	5.000	.	.	.	.	
11	GUATEM	5.000	4.26	0.737888	1.660	0.444	
12	MALAWI	5.100	3.31	1.786	1.511	0.951	*
13	NIGER	3.400	3.75	-.336874	1.681	-0.200	
14	SINGAPOR	8.500	.	.	.	.	
15	ELSALV	2.200	2.73	-.535495	1.659	-0.323	
16	MALI	7.100	3.86	3.233	1.693	1.910	***
17	UPPERVOL	3.400	.	.	.	.	
18	BENIN	3.300	5.93	-2.633	1.661	-1.585	***
19	MALAYSIA	7.700	5.92	1.779	1.674	1.062	**
20	DOMINR	6.000	4.50	1.497	1.620	0.924	*
21	LIBERIA	0.900000	2.33	-1.435	1.591	-0.902	*
22	IVORYCOA	5.700	5.86	-.167868	1.645	-0.102	
23	MAURIT	7.400	5.32	2.074	1.535	1.352	**
24	SIERRAL	2.000	.	.	.	.	
25	PANAMA	4.700	3.06	1.633	1.621	1.007	**
26	CHILE	1.900	2.72	-.819770	1.659	-0.494	
27	CHAD	-2.600	0.21237	-2.812	1.637	-1.718	***
28	TANZANIA	4.000	4.31	-.316346	1.673	-0.189	
29	UGANDA	-1.500	0.37307	-1.873	1.528	-1.226	**
30	ETHIOPIA	2.200	2.56	-.359651	1.696	-0.212	
31	CAR	1.400	-.33333	1.733	1.611	1.076	**
32	GHANA	-.500000	0.01829	-.518296	1.575	-0.329	
33	PORTUGAL	4.500	2.17	2.321	1.503	1.544	***
34	BURMA	5.000	4.43	0.567363	1.653	0.344	
35	SRILANKA	4.500	5.81	-1.319	1.646	-0.801	*
36	ZAIRE	-2.00000	3.12	-3.323	1.600	-2.077	****
37	JAMAICA	-1.100	-.02893	-1.071	1.452	-0.738	*
38	TRINIDAD	5.500	5.27	0.226242	1.533	0.148	
39	ZAMBIA	0.900000	-.43072	1.331	1.513	0.880	*
40	PERU	3.000	3.95	-.952855	1.598	-0.596	*
41	LESOTHO	6.600	9.01	-2.417	1.415	-1.703	***
42	ZIMBAB	2.200	.	.	.	.	
43	KENYA	5.500	3.31	2.189	1.688	1.297	**
44	NEPAL	2.700	.	.	.	.	
45	HAITI	3.400	4.30	-.909486	1.614	-0.564	*

SUM OF RESIDUALS 4.085
SUM OF SQUARED RESIDUALS 10

TABLE XXII

RESULTS OF THE REGRESSION ON ALL GROUP 1 COUNTRIES USING THE DUMMY VARIABLE

DEP VARIABLE: GDPGB84

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	48.292423	12.073106	14.916	0.0005
ERROR	9	7.284720	0.809413		
C TOTAL	13	55.577143			
ROOT MSE		0.899674	R-SQUARE	0.8689	
DEP MEAN		5.414286	ADJ R-SQ	0.8107	
C.V.		16.61667			

VARIABLE	DF	PARAMETER ESTIMATE	T FOR H0: PARAMETER=0	PROB > |T|	STANDARDIZED ESTIMATE
INTERCEP	1	1.518514	2.417	0.0388	0.000000
GDIGB84	1	0.346391	5.534	0.0003	0.704710
YMEYSG	1	-8.532925	-3.217	0.0105	-0.459146
CDIGA84	1	0.163636	3.162	0.0115	0.427476
YEIYSG	1	-2.121129	-1.027	0.3313	-0.136051

OBS	ID	ACTUAL	PREDICT VALUE	RESIDUAL	STD ERR RESIDUAL	STUDENT RESIDUAL	-2-1-0 1 2
1	INDIA	3.600	4.503	-.902523	0.832355	-1.084	**
2	NIGERIA	3.800	3.939	-.138750	0.601736	-0.314	
3	KOREA	8.600	8.304	0.296421	0.436942	0.673	*
4	TURKEY	5.100	4.786	0.314426	0.810182	0.388	
5	YUGOSLV	5.500	4.390	1.110	0.798010	1.391	**
6	SPAIN	3.100	3.907	-.807118	0.692042	-1.166	**
7	PARAGUA	8.500	9.672	-1.172	0.606079	-1.934	***
8	VENEZUEL	4.100	4.919	-.818923	0.840076	-0.975	*
9	MEXICO	6.400	5.780	0.619775	0.813785	0.762	*
10	BRAZIL	7.600	6.342	1.258	0.674671	1.865	***
11	ALGERIA	6.600	6.151	0.443755	0.703169	0.634	*
12	PHILIPP	6.000	5.751	0.249403	0.681748	0.366	
13	ECUADOR	3.100	.	.	.	.	
14	COLOMBIA	5.400	5.543	-.143203	0.805411	-0.178	
15	ARGENTIN	1.500	1.764	-.264054	0.679194	-0.389	
16	SAUDIAR	3.600	.	.	.	.	
17	SYRIA	8.300	.	.	.	.	
18	JORDAN	9.300	.	.	.	.	

SUM OF RESIDUALS 1.6431

SUM OF SQUARED RESIDUALS 7.

IV. CONCLUSIONS

The purpose of this paper has been to examine the relationship between defense, health, and education expenditures and economic growth in developing countries. A model for economic growth was derived through the use of factor and regression analysis and the countries were divided into two groups through the use of discriminant analysis. Application of the economic growth model to these two groups of countries provided evidence that was used to support the hypothesis of this study. It was hypothesized that less economically dynamic countries would sacrifice social expenditures such as health and education in favor of military expenditures while the more economically dynamic countries would spend on defnese as well as social needs. The basis for this hypothesis was the reasoning that military spending had a positive effect on growth while social spending had the opposite effect.

The evidence obtained through the test of the economic growth model only partially supported the hypothesis. It was found that the relationship between economic growth and defense expenditures was positive and statistically significant for the less economically dynamic countries. This result was consistent with Benoit's findings. But the effect of social expenditures was not evident since the results were not statistically significant. This lack of evidence may have been

due to data selection and availability. The addition of other variables such as welfare and housing into the social expenditures variable would have made a larger composite of data to compare with economic growth. But these variables had data that was available for a low number of observations. The test of the second model using only the two test variables showed that defense and social expenditures are positively related and statistically significant for the less economically dynamic countries. This suggested that the sacrifice of social monies for defense may not operate as hypothesized for this group.

Using the economic growth model test upon the more economically dynamic countries it was found that defense expenditures were negatively related to growth and statistically significant. This suggested that the military in these countries may perform strictly military functions while civilian sectors assume the functions of building the infrastructure and providing local security as suggested by Benoit. The second test on these countries using the test variable model showed that defense and social expenditures were negatively related and statistically significant. This suggested that there exists a trade-off between these expenditures in the more economically dynamic countries.

The uniqueness of the Latin American case was tested using the economic growth model, the test variable model, and a dummy variable. The use of the dummy variable was the

only test of the three to provide useable results. The lack of statistical significance for the value of the dummy variable provided evidence to suggest that Latin America was not unique as a region when compared to the rest of the world's developing countries as expected.

While the findings of this study do not provide the evidence necessary to support every aspect of the hypothesis some insight has been gained regarding the relationship between defense and social expenditures and economic growth for developing countries. Since this was a cross-sectional study and only looked at one point in time it would be helpful to examine government expenditures over a period of time and make comparisons in order to contribute to the formulation of a general theory of defense expenditures and economic growth.

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Thesis
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